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The Likely Impact of Mergers and Acquisitions on the Turkish Banking Sector: A Stylized Model and Simulations*

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Abstract

This paper explores various aspects of mergers and acquisitions in the banking industry within a simple model that allows explicit comparison of sector performance before and after the mergers and acquisitions. The model studies strategic interaction among commercial banks in an imperfectly competitive banking industry, and allows us to consider the determinants of the desirability as well as feasibility of mergers and acqusitions. The industry structure we look at involves a few dominant banks with a (competitive) fringe, which we take it as the structure most likely to resemble the Turkish banking industry in the aftermath of the ongoing restructuring process. Using a reasonable set of parameters to simulate the model, we do comparative statics exercises regarding the impact of mergers among domestic as well as with foreign banks on equilibrium outcomes.

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1 Introduction

Turkish banking sector is currently undergoing a wide-ranging reform effort as part of the disinflation program the Government has undertaken since December 1999. Revamping of the legal and regulatory framework for banking supervision in accordance with EU and world standards, correcting the weaknesses in the private banking system, and restructuring and ultimate privatization of the state banks are among the aims of the reform effort. Towards this end, the powers of the independent Banking Regulatory and Supervisory Agency (BRSA), which had been established as part of a new banking law in June 1999, were further strengthened through a series of amendments approved in Parliament in December 1999. As the single regulatory and supervisory agency to oversee the sector, BRSA is to have completely independent jurisdiction over the entry and exit of banks and over changes to the regulatory framework.

The Turkish banking industry faced distorted incentives in the chronically high and erratic inflationary environment and with increasing government deficits over the last two decades. Excessive and persistent public sector borrowing requirements have led to very high real returns in government issued securities that allowed some private banks to accumulate asset portfolios that were far from being sound. Together with the slackening of entry requirements to the sector over the last decade and overall weakness of the regulatory framework, this environment contributed to the fragmentation of the banking sector into small banks. A significant number of small banks carrying weak asset portfolios became insolvent over time and had to be transfered to the Savings Deposit Insurance Fund. The recent banking crisis in December 2000 can be seen as a culmination of persistent distortions in the Turkish banking sector.

The new and tougher regulatory framework, together with the new macroeconomic environment that is expected to arise from the disinflation program, is very likely to necessitate significant changes in the Turkish banking sector. This includes the increased likelihood of significant mergers and consolidation in the sector. Such a process is also expected to increase the presence of foreign banks in Turkey through acquisitions.

Understanding various impacts of mergers and acquisitions requires modelling of the banking industry structure and behavior of banks. The objective of this paper is to explore various aspects of mergers and acquisitions within a simple albeit rigorous model that allows explicit comparison of sector performance before and after mergers and acquisitions. The model studies strategic interaction among commercial banks in an imperfectly competitive banking industry, and allows us to consider the determinants of feasibility and desirability of mergers and acqusitions among domestic as well as with foreign banks.

Given the aims of the ongoing fundamental reform process in the sector, we abstract from much of the features that are currently relevant, and concentrate on a sector structure that is expected to arise after the proposed restructuring is successfully completed. This amounts to looking at a banking industry in a stabilized economy in which all public banks are privitized, banking regulations are in place and fully enforced.

The main features of the stylized model we will develop can be summarized as follows. Adopting an Industrial Organization approach, we consider an imperfectly competitive banking industry. Banks are assumed to act as independent entities that react strategically to their environment with deposits received, loan amounts serviced, and net foreign position viewed as strategic variables. The industry structure we look at involves a few dominant banks with a (competitive) fringe, which we take it as the structure most likely to resemble the Turkish banking industry in the aftermath of the ongoing restructuring process. For a given as well as changing number of firms, we first study the features of equilibrium outcomes such as the size of banking industry, interest rates (deposit, loan, and interbank rates) etc. Using a reasonable set of parameters to simulate the model, we go on to do various comparative statics exercises regarding the impact of mergers among domestic as well as with foreign banks on equilibrium outcomes. Other comparative statics exercises that we carry out include the the impact of deposit insurance, reserve requirement ratios, the country's international credit rating, and the global economic conditions.

The plan of the paper is as follows. In Section 2, we present the model we study. Section 3 presents the empirical application. Discussion and conclusions follow in Section 4.

2 A Stylized Model of the Banking Industry

In the Industrial Organization approach we adopt here, a bank is viewed as a firm that uses labor and physical capital as inputs to produce different financial services for depositors and borrowers.[1] The banking activity is thus viewed as production of deposit and loan services. In addition, we model the banking industry as an imperfectly competitive environment in which banks act as independent entities. As an approximation of the structure of Turkish banking industry we will assume that there are few dominant banks together with a competitive fringe. The economy is assumed to be open so that the banking industry can borrow and lend freely in the world financial markets.

Specifically, we assume there to be a total of N domestic banks operating in an oligopolistic industry. There are assumed to be n banks in the dominant group while the competitive fringe consists of m banks, with $n+m=N$. Each bank is characterized by a cost function

$$c_i(D_i, L_i, F_i),$$

where D_i is the deposits collected and L_i is the loans extended by bank i, and F_i is bank i's net position on the world financial market. The balance sheet of a typical bank is displayed below:

[1] For various models of banking industry structure and bank behavior see Freixas and Rochet [4]

Assets	**Liabilities**
Loans (L)	Deposits (D)
Reserves (R)	Net Foreign Position (F)

Note that the reserves for a bank i is given by

$$R_i = D_i - L_i + F_i.$$

Cash reserves, C_i, and the the net position on the interbank market,.M_i, will make up bank i's reserves R_i

The cash reserves C_i bear no interest, and therefore will be set at the minimum level required by the Central Bank. Letting α be the reserve requirement ratio on domestic deposits and β be the reserve requirement ratio on foreign credits set by the Central Bank, we will have

$$C_i = \alpha D_i + \beta F_i, \qquad \text{for all } i.$$

The banks collect the deposits from the households and borrow from international financial markets, and channel these funds to firms to finance their investment needs. The third actor in the real sector is the government. The government finances its deficit G either by issuing securities $\triangle B$ or by issuing high powered money $\triangle M_0$. Assuming that households do not hold cash, the high powered money is only used to finance banks' compulsory cash reserves held in their accounts at the Central Bank. That is,

$$M_0 = \sum_{i=1}^{N} C_i = \alpha \sum_{i=1}^{N} D_i + \beta \sum_{i=1}^{N} F_i$$

We will assume that banks are differentiated in terms of their perceived riskiness

in the domestic financial market as well as in the foreign financial markets. Each bank i faces an upward sloping inverse supply function of savings $r_i^D(S)$, where $S = B + D$, with B being the outstanding government securities and $D = \sum_{i=1}^{N} D_i$. Banks' different perceived financial strengths are assumed to be summarized by parameters $\lambda_i \geq 1$ such that $r_i^D(S) = \lambda_i r^D(S)$, where $r^D(S)$ is the upward sloping inverse supply function of savings faced by the least risky bank (i.e. the bank i^* with $\lambda_{i^*} = 1$). Each bank i is assumed to face a downward sloping inverse demand function of loans $r^L(L)$, where $L = \sum_{i=1}^{N} L_i$. The cost of borrowing from the international financial market for bank i is $r_i^F = \mu_i r^F$, where $\mu_i \geq 1$ is bank i's perceived strength in the international financial market and r^F is the risk free foreign interest rate. Finally, banks can borrow and lend in the interbank market at rate r.

2.1 The Behavior of the Dominant Group and the Competitive Fringe

The choice variables of the banks are deposits D_i, loans L_i, and net foreign position F_i. Taking into account the operational costs, the profit of bank i will be given by

$$\pi_i\left(D_i, L_i, F_i\right) = r^L\left(L\right) L_i + rM_i - \lambda_i r^D\left(S\right) D_i - \mu_i r^F F_i - c_i\left(D_i, L_i, F_i\right), \tag{1}$$

where M_i, the net position of the bank i in the interbank market, is

$$M_i = \left(1-\alpha\right) D_i + \left(1-\beta\right) F_i - L_i. \tag{2}$$

Substituting (2) in (1) yields

$$\begin{array}{rl} \pi_i\left(D_i, L_i, F_i\right) = & \left[r^L\left(L\right) - r\right] L_i + \left[r\left(1-\alpha\right) - \lambda_i r^D\left(S\right)\right] D_i \\ & + \left[r(1-\beta) - \mu_i r^F\right] F_i - c_i\left(D_i, L_i, F_i\right) \end{array}. \tag{3}$$

Thus, the banks' profits are the sum of the intermediation margins on loans, deposits, and the net foreign position net of operational costs.

The banks in the competitive fringe are price takers in all three markets. That is, in addition to the risk free foreign rate r^F, they take the loan rate r^L and the deposit rate r^D determined by the dominant group as given as well. The first order conditions for the banks in the competitive fringe are

$$\frac{\partial \pi_i^f}{\partial D_i} = r\left(1-\alpha\right) - \lambda_i r^D - \frac{\partial c_i}{\partial D_i} = 0, \tag{4}$$

$$\frac{\partial \pi_i^f}{\partial L_i} = r^L - r - \frac{\partial c_i}{\partial L_i} = 0, \tag{5}$$

$$\frac{\partial \pi_i^f}{\partial F_i} = r\left(1-\beta\right) - \mu_i r^F - \frac{\partial c_i}{\partial F_i} = 0. \tag{6}$$

Let $L_i^f\left(r^L, r_i^D, r_i^F, r\right)$, $D_i^f\left(r^L, r_i^D, r_i^F, r\right)$, $F_i^f\left(r^L, r_i^D, r_i^F, r\right)$ be the loan supply, deposit demand, and net foreign position of the banks in the competitive fringe, respectively, found by solving (4), (5), and (6) simultenously. Define

$$L^f\left(r^L, r_i^D, r_i^F, r\right) \equiv \sum_{i=1}^{m} L_i^f\left(r^L, r_i^D, r_i^F, r\right), \tag{7}$$

$$D^f\left(r^L, r_i^D, r_i^F, r\right) \equiv \sum_{i=1}^{m} D_i^f\left(r^L, r_i^D, r_i^F, r\right), \tag{8}$$

and

$$F^f\left(r^L, r_i^D, r_i^F, r\right) \equiv \sum_{i=1}^{m} F_i^f\left(r^L, r_i^D, r_i^F, r\right) \tag{9}$$

as the total loan supply, the total deposit demand, and the total net foreign position of the fringe, respectively. The residual demand for loans function that the dominant group will face will be $L^r\left(r^L\right) = L\left(r^L\right) - L^f$, where $L\left(r^L\right)$ is the total demand for loans (inverse of $r^L\left(L\right)$). Similarly, the residual supply of deposits function will be $S^r\left(r^D, \boldsymbol{\lambda}, \boldsymbol{\mu}\right) = S\left(r^D, \boldsymbol{\lambda}, \boldsymbol{\mu}\right) - D^f - B$, where $S\left(r^D, \boldsymbol{\lambda}, \boldsymbol{\mu}\right)$ is the total supply of savings, with $\boldsymbol{\lambda} = (\lambda_1, ..., \lambda_N)$ and $\boldsymbol{\mu} = (\mu_1, ..., \mu_N)$. The banks in the dominant group are assumed to engage in quantity (Cournot) competition in determining their supply of loans and demand for deposits. Given the behavior of the competitive fringe, the first order conditions summarizing the dominant group banks' maximizing behavior are

$$\frac{\partial \pi_i^d}{\partial D_i} = r\left(1-\alpha\right) - \lambda_i\left(D_i \frac{\partial S^{r^{-1}}\left(r^D, \boldsymbol{\lambda}, \boldsymbol{\mu}\right)}{\partial D_i} + S^{r^{-1}}\left(r^D, \boldsymbol{\lambda}, \boldsymbol{\mu}\right)\right) - \frac{\partial c_i}{\partial D_i} = 0, \tag{10}$$

$$\frac{\partial \pi_i^d}{\partial L_i} = L_i \frac{\partial L^{r^{-1}}\left(r^L\right)}{\partial L_i} + L^{r^{-1}}\left(r^L\right) - r - \frac{\partial c_i}{\partial L_i} = 0, \tag{11}$$

$$\frac{\partial \pi_i^d}{\partial F_i} = r\left(1-\beta\right) - \mu_i r^F - \frac{\partial c_i}{\partial F_i} = 0. \tag{12}$$

Let $L_i^d\left(r^L, r_i^D, r_i^F, r\right)$, $D_i^d\left(r^L, r_i^D, r_i^F, r\right)$, $F_i^d\left(r^L, r_i^D, r_i^F, r\right)$ be the loan supply, deposit demand, and net foreign poisition of the banks in the dominant group, respectively, found by solving (10), (11), and (12) simultenously. Define

$$L^d\left(r^L, r_i^D, r_i^F, r\right) \equiv \sum_{i=1}^{n} L_i^d\left(r^L, r_i^D, r_i^F, r\right), \tag{13}$$

$$D^d\left(r^L, r_i^D, r_i^F, r\right) \equiv \sum_{i=1}^{n} D_i^d\left(r^L, r_i^D, r_i^F, r\right), \tag{14}$$

and

$$F^d\left(r^L, r_i^D, r_i^F, r\right) \equiv \sum_{i=1}^{n} F_i^d\left(r^L, r_i^D, r_i^F, r\right) \tag{15}$$

as the total loan supply, the total deposit demand, and the total net foreign position of the dominant group, respectively.

2.2 Equilibrium

Summing condition (2) over all banks will give the market clearing condition in the interbank market:

$$(1-\alpha)\left[D^d(\cdot)+D^f(\cdot)\right]+(1-\beta)\left[F^d(\cdot)+F^f(\cdot)\right]=L^d(\cdot)+L^f(\cdot). \quad (16)$$

The market clearing conditions in the loan market and the deposit market will be given by

$$L\left(r^L\right)=L^d(\cdot)+L^f(\cdot), \quad (17)$$

and

$$S\left(r^D,\boldsymbol{\lambda},\boldsymbol{\mu}\right)=B+D^d(\cdot)+D^f(\cdot), \quad (18)$$

respectively. Note that all of the banks are assumed to be price takers in the foreign credit markets. Solving 16, 17, and 18 simultaneously will give the noncooperative equilibrium in the banking industry for given N, λ_i, μ_i, α, β, and r_F. Some of the comparative statics exercises that can be carried out thus involve changes in N, n, and m (impact of mergers); changes in α and β (impact of reserve requirement ratios); changes in λ_i (impact of deposit insurance); μ_i (impact of country's international credit rating, or acquisitions by foreign banks); and r_F (impact of global economic conditions).

3 Empirical Application

We use special functional forms in simulating the model. As the inverse demand function for loans and the inverse supply function of deposits we use

$$r_L(L)=A_L-B_L L \quad (19)$$

and

$$r_D(S)=A_D+B_D S, \quad (20)$$

respectively. As for the cost functions, we assume that the banks in the dominant group have a cost advantage over those in the fringe.[2] We assume that the costs of banks in the dominant group are linear in deposits and loans, but quadratic in funds borrowed from abroad. The functional specification adopted for the cost function of the banks in the dominant group is

$$c^d(D_i,L_i,F_i)=K^d+\sigma_D D_i+\sigma_L L_i+\frac{\sigma_F}{2}F_i^2. \quad (21)$$

[2] Evidence on economies of scale in banking industry is mixed. Various studies show that only very small banks have a potential to achieve scale economies and that the average cost curve beomes quickly more or less flat for the larger firms (see Dermine [3] and references cited therein).

The banks in the fringe are assumed to have decreasing returns to scale in production. Their cost function is assumed to have the following form:

$$c^f(D_i, L_i, F_i) = K^f + \frac{\rho_D}{2} D_i^2 + \frac{\rho_L}{2} L_i^2 + \frac{\rho_F}{2} F_i^2. \tag{22}$$

The effect of the changes in the parameters of the model will be assessed mainly according to their impact on welfare. The welfare measure used is the total surplus (the sum of depositors' and creditees' surpluses and total profits of the banks).

To the extent possible we use data from Turkish banking industry. When data is not available on a particular parameter, we concentrate on reasonable range of values and consider the robustness of results to changes in the parameter values. The base case of parameters used in most of empirical applications are summarized in the table below.

Table 1: Base Model Parameter Values*					
$n_0 = 5$	$A_D = 0.01$	$K^d = 0.2$	$K^f = 0.03$	$\lambda^d = 1$	$r^F = 0.3$
$m_0 = 15$	$B_D = 0.01$	$\sigma_D = 0.01$	$\rho_D = 0.04$	$\lambda^f = 1$	$B = 9.7$
$\alpha = 0.06$	$A_L = 0.9$	$\sigma_L = 0.02$	$\rho_L = 0.05$	$\mu^d = 1.05$	
$\beta = 0.03$	$B_L = 0.01$	$\sigma_F = 0.06$	$\rho_F = 0.15$	$\mu^f = 1.1$	
* The TL values are in quadrillion for the relevant parameters (A_D, A_L, K^d, K^f, B).					

We took the group of privately owned commercial banks listed in the Appendix below as representing the completely privatized banking industry structure in our model. The assets of these 20 banks make up about 95% of the assets of all privately owned commercial banks in Turkey, and roughly the same ratio applies to deposits and loans as well. In the "dominant" group there are 5 banks, each with assets in the U.S.D 5-10 billion range. The total assets of these banks make up about 61% of the assets of all privately owned commercial banks. The rest of the banks listed in Table A2 are considerably smaller in size than the first (the dominant) group. This group of 15 banks is taken as the "fringe" without market power. Thus, as the base line values of n and m we take $n_0 = 5$ and $m_0 = 15$, respectively.

The reserve requirement of 6% (for 1999) is taken as the value for α, while the liquidity requirement ratio for liabilities in foreign currency of 3% (for 1999) is taken as the value for β.

In arriving at values for K^d and K^f we use the overhead costs to assets ratio (6%) reported in Demirgüç-Kunt and Levine [2].

Given the blanket deposit insurance in Turkey that every bank enjoys without discrimination, in the base case the perceived financial strength (from the viewpoint of depositors) of all banks are taken as equal, i.e. $\lambda^d = \lambda^f = 1$.

The average LIBOR rate for 1999 (expressed in terms of TL) is taken as the value for (risk free) cost of borrowing in international markets. The values

for μ^d and μ^f is arrived at by considering the difference in borrowing costs of representative banks from the dominant and the fringe groups.

3.1 Analysis of Mergers and Acquisitions

3.1.1 Mergers Among Fringe Banks

Will a fringe bank acquire another fringe bank? The first question we consider is whether a fringe bank will have an incentive to acquire another fringe bank. We will first look at the case where the merged entity is still a fringe bank; the other case is where the merged entity becomes a dominant bank.

When a fringe bank acquires another fringe bank and the merged entity still remains a fringe bank, the post-merger profits of the fringe banks are higher. The maximum amount that a fringe bank will bid to acquire another fringe bank is the difference between its pre- and post-merger profits. The targeted fringe bank or banks will accept the offer to merge if the bid they receive exceeds their pre-merger profits.

Mergers will shrink the size of the fringe through either sequential mergers, whereby one bank is acquired at a time, or block acquisitions, whereby a number of banks are acquired together. Note that the extent of consolidation will be much more under block acquisitions than under sequential acquisitions. In the sequential case, the market power and profits of the remaining banks are increased at each stage, making further acquisitions more costly for the acquiring bank.

Table 2: Mergers among fringe banks

$n = 5$			
m	$\pi^f\ (K^f = 0.03)$	$\pi^f\ (K^f = 0.06)$	$\Delta\pi^f$
1	135.57	105.57	
2	112.70	82.70	22.86
3	96.85	66.85	15.84
4	85.11	55.11	11.74
5	75.97	45.97	9.14
6	68.58	38.58	7.39
7	62.43	32.43	6.15
8	57.19	27.19	5.24
9	52.63	22.63	4.55
10	48.62	18.62	4.01
11	45.05	15.05	3.57
12	41.82	11.82	3.22
13	38.90	8.90	2.92
14	36.22	6.22	2.67
15	33.75	3.75	2.46

Note: Profit figures (π^f) are in trillion TL.

Table 2 exhibits, for the base case as well as with higher fixed costs for the fringe, the change in the profits of the fringe banks as the size of the fringe

varies. We observe that in the base case there is no profitable acquisition of a fringe bank by another fringe bank regardless of whether the acquisitions are carried out sequentially or in block. As fixed costs of the fringe banks increase block acquisitions do become profitable, however. In the high fixed cost case presented in Table 2, seven banks could profitably merge. We observe that sequential mergers are not profitable in this case.[3]

As mentioned above, merging of fringe banks may lead to their acquiring of enough resources to become one of the dominant banks. The comparative statics exercise that is involved here requires checking whether there exists incentives for the fringe banks to become a dominant bank. Table 3 below shows that the profits of a fringe bank will increase when it is converted to a dominant firm, as to be expected. If the increase in profits exceeds the cost of investment to acquire the requisite technology to operate as a dominant bank, a single fringe bank will indeed choose to become a dominant bank.[4] For example, the profit of a fringe bank in an industry with $m = 15$ and $n = 5$ is 33.7 trillion TL and the profit of a dominant bank in an industry with $m = 14$ and $n = 6$ is 82.6 trillion TL; therefore, if the cost of investment to acquire the requisite technology to operate as a dominant bank is less than 48.9 trillion TL, a fringe bank would choose to become a dominant bank.

Tablo 3: Fringe banks merging into a dominant bank

	$n = 5$		$n = 6$	
m	π^d	π^f	π^d	π^f
1	719.78	135.57	518.22	109.01
2	607.96	112.70	434.94	91.41
3	522.82	96.85	371.22	79.06
4	455.34	85.11	320.49	69.80
5	400,23	75.97	278.89	62.52
6	354.16	68.58	243.98	56.57
7	314.94	62.43	214.15	51.58
8	281.03	57.19	188.27	47.29
9	251.36	52.63	165.53	43.54
10	225.11	48.62	145.35	40.22
11	201.67	45.05	127.29	37.23
12	180.60	41.82	110.99	34.53
13	161.52	38.90	96.18	32.07
14	144.14	36.22	82.67	29.80
15	128.22	33.75	70.26	27.70

Note: Profit figures $\left(\pi^d, \pi^f\right)$ are in trillion TL.

Also observe from Table 3 that two fringe banks could profitably merge to become the sixth dominant bank in an industry structure with $m = 13$ and

[3] As fixed costs do not affect marginal decisions of banks, $\Delta\pi^f$ is the same for all levels of fixed costs. However, fixed costs affect level of profits and thus the feasibility of mergers.

[4] The assumption here is that there are no other extra-economic barriers that would prevent a fringe bank from acquiring the requisite technology to become a dominant bank.

$n = 6$. The profit of a dominant bank in the industry structure with $m = 13$ and $n = 6$ is 96.1 trillion TL and this exceeds 67.4 trillion TL, which is the total pre-merger profits of the two fringe firms, by 28.7 trillion TL. Note that the profit advantage of becoming a dominant bank decreases in this case, making mergers among fringe firms less likely. We observe from Table 3 that it would not be profitable for three fringe banks to merge and than convert into a dominant bank.

Should Fringe Banks Merge? We now turn to evaluating the desirability of mergers to see whether they conflict with incentives of banks to merge. As can be seen from Figure 1, for the base case of parameters we consider, merging firms in the fringe may in fact lead to decrease in total surplus as long as the size of the dominant group remains the same (the dashed line in Figure 1). Recall from above that there were no incentives on the part of fringe firms to merge in this case either.

On the other hand, if the fixed costs of the fringe banks were higher, it would have been welfare improving to reduce the number of banks in the fringe through consolidations among themselves. In Figure 1 the dashed curve displays such a case, where the total surplus maximizing number of firms in the fringe (when $n = 5$) is 12, indicating desirability of mergers with respect to the base case where m is 15. Though we would expect total surplus to increase with more competiton, increasing m might not lead to higher welfare because of fixed costs of operation. If fixed costs are sufficiently small, then increasing the number of banks in the fringe will always be welfare increasing. This is due to decreasing returns to scale in production for the fringe. Recall from above that, though sequential mergers were not profitable, block mergers did turn out to be profitable in this case. Note, however, that the reduction in the size of the fringe (to a total of eight banks) leads to a smaller fringe than the optimal size identified in Figure 1.

Figure 2 displays the impact of changing the size of both the dominant and the fringe group on total surplus. We observe that merging a number of fringe banks and turning them into a dominant bank will not necessarily increase welfare. For example, combining two fringe banks (thus reducing m to 13) and turning them into one dominant bank (thus making $n = 6$) will reduce welfare. This is despite the fact that competition among the dominant group has increased with the addition of one firm, and the improved variable cost when the fringe firms are merged and become a dominant bank. The high fixed cost of operating a dominant firm may exceed gains from increased competition and improved production efficiency. But this result will change if cost structure is different (e.g fixed costs are lower), as seen in Figure 3. Here it will desirable to merge the banks in the fringe and turn them into a dominant bank.

Note also from Figure 3 that whether it is desirable to merge the fringe banks or not will depend on how many dominant firms there are. If there are four banks in the dominant group it will not increase welfare to reduce the number of fringe banks. If, however, n is larger then mergers in the fringe

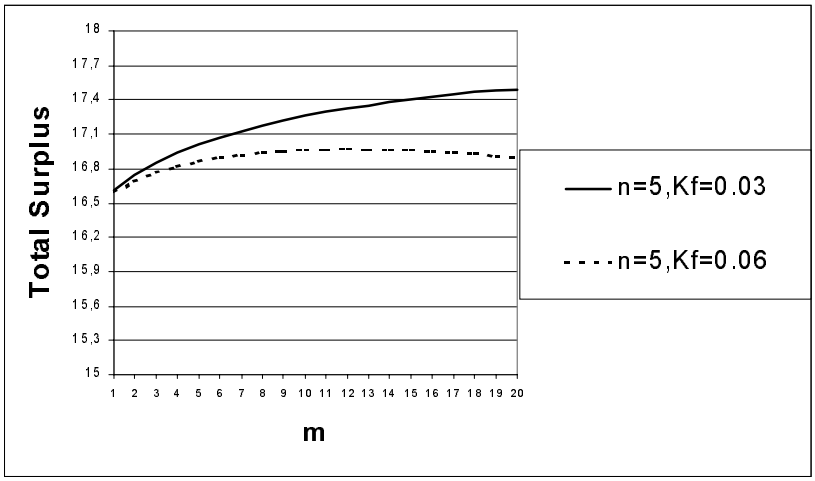

Figure 1: Changing m keeping n constant

become desirable.

3.1.2 Mergers Among Dominant Banks

Will a dominant bank acquire another dominant bank? Table 4 presents the change in the profits of the dominant banks as the size of the dominant group varies in the base case. Whether sequential or block mergers among dominant banks will be profitable depends very much on their fixed costs of operation. In the base case where fixed costs are relatively low, the increase in profits when competition is lessened with a sequential merger will not exceed the pre-merger profits of a targeted dominant bank. Block mergers will, however, be feasible: four dominant banks can profitably merge at once, leading to a two-bank dominant group. On the other hand, when fixed costs are high, profits in the pre-merger stage are low, making mergers more likely. In the case presented in Table 4 (with $K^d = 0.25$), both sequential and block mergers are feasible.

Tablo 4: Mergers among dominant banks

$m = 15$			
n	$\pi^d \ (K^d = 0.2)$	$\pi^d \ (K^d = 0.25)$	$\Delta\pi^d$
1	1593.22	1543.22	
2	696.66	646.66	896.55
3	374.25	324.25	322.41
4	218.12	168.12	156.13
5	70.26	78.22	89.89

Note: Profit figures (π^d) are in trillion TL.

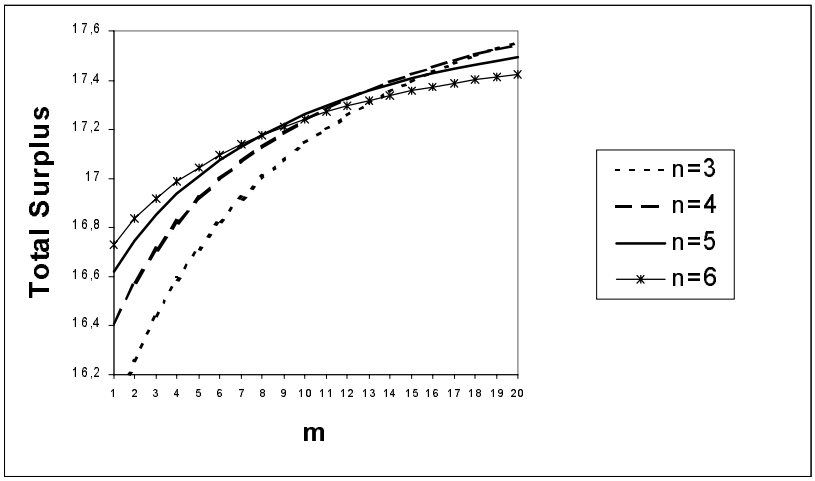

Figure 2: Changing both m and n

Should dominant banks merge? Whether dominant banks should merge or not depends on the fixed costs in the dominant group as well as on the size of the fringe. We can use Figure 2 to consider the impact of changing the size of the dominant group on total surplus. Though there is no incentive for the banks themselves to merge in this case, it turns out that shrinking the size of the dominant group to $n = 4$ would increase total surplus when $m = 15$. Further reducing the size of the dominant group to $n = 3$ would reduce the total surplus, however. Reducing the dominant group by one bank saves on the fixed costs at the expense of reduced competition; competition effect takes over when there is further reduction in the number of banks and the negative impact on total surplus exceeds the savings from fixed costs. If fixed costs in the dominant group were higher, further reducing the size of the dominant group would have been warranted.

One other factor that allows welfare improving reduction in the size of the dominant group is the presence of a sizeable fringe with 15 banks. If the competitive fringe were smaller, say with $m = 6$, increasing the size of the dominant group would have increased monotonically the total surplus.

3.1.3 Mergers Involving Both Dominant and Fringe Banks

Will a dominant bank acquire a fringe bank? Consider now the case where fringe banks are bought out by a dominant bank in a sequential manner (so m decreases while n remains constant) . In the base case, there turns out to be no incentive for such acquisitions of fringe banks by a dominant bank (see Table 5). For block mergers to be profitable, one dominant bank will have to acquire 13 fringe banks at once, which indicates that this kind of mergers will

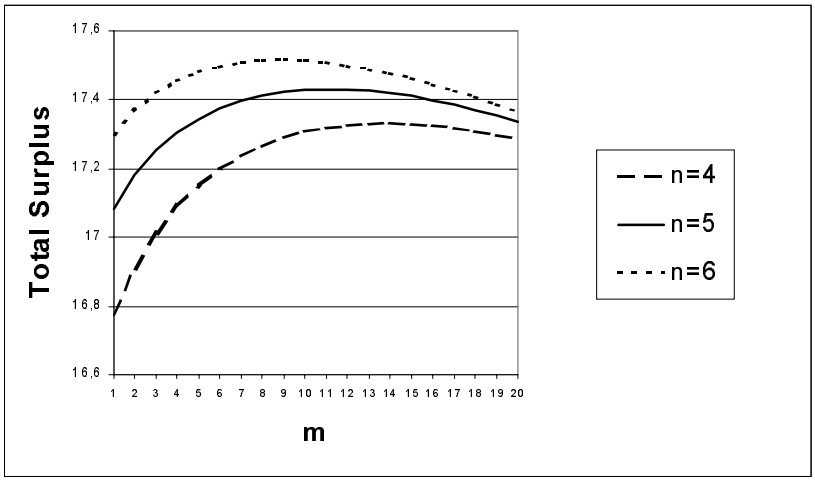

Figure 3: Changing both n and m when K^d is low

be difficult to realize When fixed costs of the fringe banks are higher, then both sequential as well as block acquisitions of fringe banks by a dominant bank are feasible. For example, when $K^f = 0.05$, it will be desirable for a dominant bank to acquire fringe banks sequentially until the size of the fringe falls to 12. It would also be profitable to acquire the whole fringe en masse (see Table 5)

Tablo 5: Dominant firms acquiring fringe firms

	$n=5$			
m	π^d	$\pi^f\ (K^f=0.03)$	$\pi^f\ (K^f=0.05)$	$\Delta\pi^d$
1	719.78	135.57	115.57	
2	607.96	112.70	92.70	111.81
3	522.82	96.85	76.85	85.14
4	455.34	85.11	65.11	67.48
5	400.23	75.97	55.97	55.11
6	354.16	68.58	48.58	46.06
7	314.94	62.43	42.43	39.22
8	281.03	57.19	37.19	33.90
9	251.36	52.63	32.63	26.67
10	225.11	48.62	28.62	26.25
11	201.67	45.05	25.05	23.43
12	180.60	41.82	21.82	21.07
13	161.52	38.90	18.90	19.08
14	144.14	36.22	16.22	17.38
15	128.22	33.75	13.75	15.91
Note: Profit figures (π^d, π^f) are in trillion TL.				

Should a dominant bank acquire a fringe bank? Welfare analysis in this case is similar to evaluating desirability of mergers among fringe banks while keeping the size of the dominant group intact. Figure 1 demonstrates, for the base case, that acquisition of fringe banks by dominant banks may lead to decrease in total surplus (the solid line in Figure 1). On the other hand, if the fixed costs in the fringe banks are higher acquisition of fringe banks by dominant banks will be welfare improving (the dashed curve in Figure 1).

3.2 Changes in Policy Variables

3.2.1 Reserve Requirement Ratio

Figure 4 displays the impact of changing the reserve requirement ratio from 6% to 4%. This policy change does not have any impact on the desirablity of mergers in the fringe. Decreasing α has the following impact on the equilibrium outcomes in this example: r decreases, r_D increases, r_L decreases, the profits of both the dominant and the fringe banks decrease, and total welfare increases. A decrease in α amounts to cost reduction which favors the depositors and creditees.

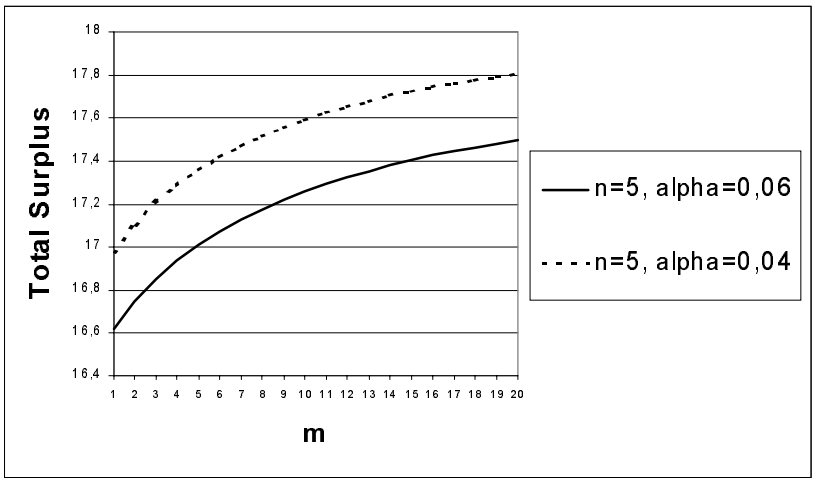

Figure 4: Changing α

3.2.2 Deposit Insurance

Figure 5 displays the impact of changes in the perceived financial strength of the banks. In the base case we consider, the dominant and the fringe banks are assumed to have the same financial strength from the view point of the depositors. This is justified in the presence of blanket deposit insurance extended to depositors of all bank without discrimination, which has been the

case in Turkey since 1994. Any change in the deposit insurance system that will lead to differences in perceived financial strength of banks will be expected to change equilibrium outcomes. In the example exhibited in Figure 5, an increase in the perceived riskiness of the fringe banks does not have an impact on the desirability of mergers among the fringe firms. Increasing λ^f has the following impact on the equilibrium outcomes in this example: r increases, r_D decreases, r_L increases, the profits of the dominant banks increase while those of the fringe banks decrease, and total surplus decreases. Though the change in total surplus is rather small in the case exhibited in Figure 5, the increase in the market share of dominant banks in deposits may be considerable, leading to driving of the fringe banks out of the sector.

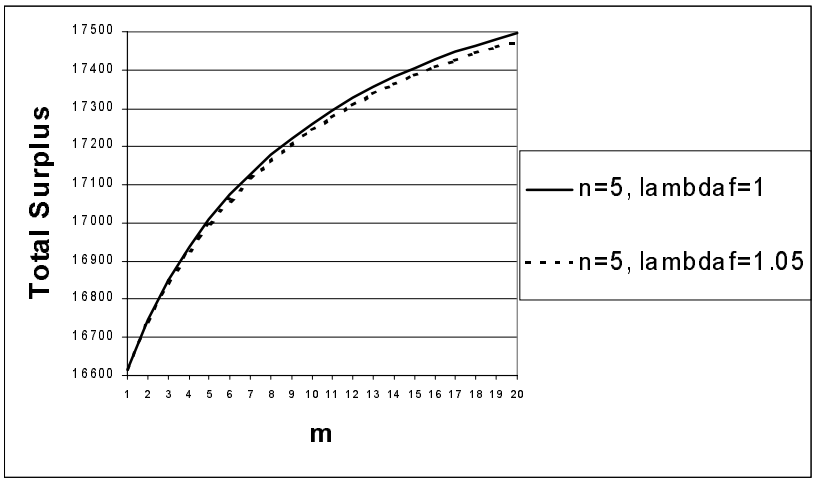

Figure 5: Changing λ^f

3.3 Acquisition by Foreign Banks

Consider a scenario in which foreign banks establish considerable presence in Turkish banking industry through acquisitions. If the dominant group is now dominated by foreign banks, one implication of this will be the ease of access to international financial markets. We can capture this change by considering a reduction in μ^d. Figure 6 displays the impact of such a change on total welfare. In the example exhibited in Figure 6, an decrease in the perceived riskiness in international markets of the dominant banks does not have any impact on the desirability of mergers among the fringe. Decreasing μ^d has the following impact on the equilibrium outcomes in this example: r decreases, r_D decreases, r_L decreases, the market share of dominant banks in deposits decreases, the profits of the dominant banks increase and the fringe banks decrease, and total welfare increases.

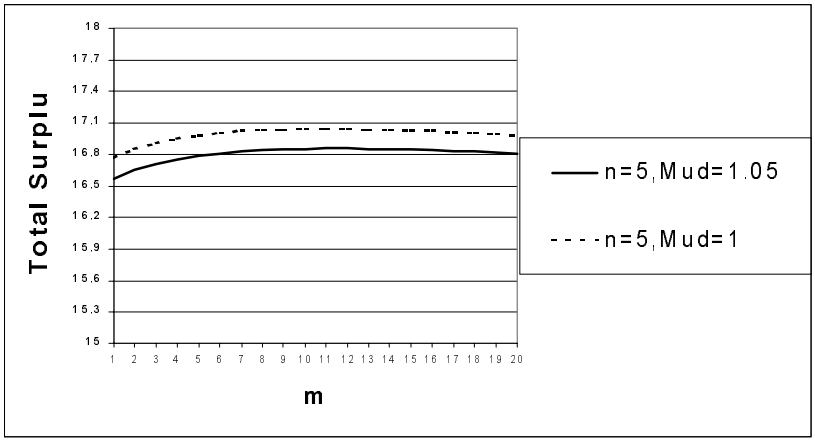

Figure 6: Changing μ^d

3.4 Changes in Global Economic Conditions

In our model the impact of the economic conditions external to the country is summarized by r_F. In Figure 7 below we look at the impact of changes in this parameter. If the conditions in the world economy worsens so that r_F increases, the equilibrium outcomes move in the following directions in the example exhibited in Figure 7: r, r_D, and r_L all increase; the profits of both the dominant and fringe banks decrease, and total welfare also decreases. Note that mergers among fringe banks now become desirable.

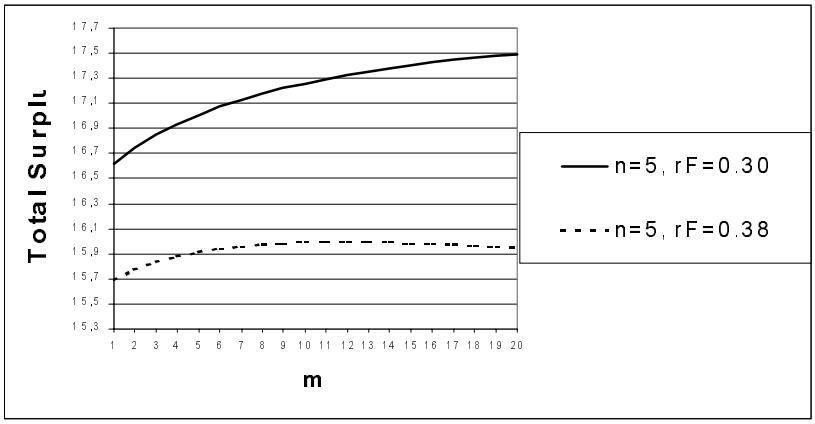

Figure 7: Changing r_F

4 Concluding Remarks

We know from the Industrial Organization literature that a merger in an imperfectly competitive industry involves two main effects. One is the decrease in competition due to reduced number of players in the market. The only countervailing effect that can balance this negative impact is the possible efficiency gains that may be realized at the end of the merger. This will more likely be the case in industries where production exhibits increasing returns to scale. In such a case the merger will allow taking advantage of economies of scale and result in more efficient overall production in the industry. Whether the increase in welfare due to efficiency gains or the adverse effect of reduced competition will outweigh the other will in general depend on the specifics of the industry.

In a simple albeit rigorous model, we studied a series of scenarios and assessed the likely impact of mergers and acquisitions in the Turkish banking industry. Our exploration clearly shows the importance of quantifying empirically the cost structures and other related parameters for accurate assessment of pros and cons of mergers in the banking industry. Depending on parameter values, especially the fixed costs of operating a bank, we identified cases where mergers among fringe banks as well as the dominant banks turn out to be desirable from welfare point of view.

Whether there will indeed be incentives to merge or not is a question related to, but different than, the desirability of mergers. In cases where there is incentive to merge with adverse welfare impacts, the competition authority may want to step in to block the proposed merger. We identified such cases where dominant banks will have incentive to make bids to acquire fringe banks that will be acceptable to the targeted banks. We also showed that whether the mergers proceed sequentially, i.e. one firm is acquired first and then the other, or a number of firms are acquired in block makes a difference for the desirability of mergers. As far as incentives to merge are concerned, the extent of consolidation will be much more under block acquisitions than under sequential acquisitions. In the sequential case, the market power and profits of the remaining banks are increased at each stage, making further acquisitions more costly for the acquiring bank.

When mergers involving only the fringe firms are considered, we found out that as fixed costs of the fringe banks increase block acquisitions did become profitable. High fixed costs in this case also made decreasing the number of fringe firms preferable from welfare point of view; the extent of consolidation that would come about could, however, be more than the optimal size identified. In the case of a number of fringe banks merging and becoming a dominant bank, total surplus will in certain cases decrease. This is despite the fact that competition among the dominant group has increased with the additional banks, and the improvement in variable cost when the fringe banks become larger. The high fixed cost of operating a large bank may exceed gains from increased competition and improved production efficiency.

Whether sequential or block mergers among dominant banks will be profitable depends very much on their fixed costs of operation. As the fixed costs

of operating a large bank rise, block mergers as well as sequential mergers may become feasible. Whether dominant banks should merge or not depends on the fixed costs in the dominant group as well as on the size of the fringe.

When fixed costs of the fringe banks are high, then both sequential as well as block acquisitions of fringe banks by a dominant bank become feasible. Welfare analysis in this case demonstrates that acquisition of fringe banks by dominant banks may increase or decrease total surplus depending on the fixed costs of the fringe banks.

The changes in reserve requirement ratio, the extent of deposit insurance, and improved perception of riskiness in international financial markets do affect the equilibrium outcomes obtained. On the other hand, incentives to merge do not seem to be significantly affected by changes in these variables. A dramatic effect of removing the blanket deposit insurance may be the forcing of the fringe banks out of the sector, which will reduce total surplus. We also demonstrated how worsening of the conditions in the world economy may render consolidation of the fringe desirable from welfare point of view.

A number of lessons can be drawn from our analysis regarding mergers in the banking sector. As for whether mergers will occur or not, the nature of the merged entity is of critical importance. If two fringe banks merge to become a dominant bank this indicates not only an improvement in the cost structure but also enhanced market power. Thus even in cases where there is no incentive for fringe firms to merge to remain a fringe firm, they will merge if through merging they can exercise market power. Welfare consequences of such mergers have to be carefully analyzed, paying due attention to the relative size of the fringe and the dominant group and the cost structure in the banking industry before and after mergers. Consolidations among both fringe and the dominant banks may turn out to be excessive, and thus their extent has to be carefully assessed by competition authorities. Though block mergers, where a group of banks is acquired by another bank, is not necessarily welfare reducing, this type of mergers may end up stifling competition too much. Sequential mergers, where only one bank can be acquired at a time, are more difficult; thus, allowing only this type of mergers will be a safety check against excessive mergers.

Finally it is to be noted that mergers among dominant as well as fringe banks will be impeded by a prisoners' dilemma type interaction among each other. Consolidation in the sector will benefit all banks through reduced competition. But those that are not actually involved in mergers will not bear merging costs. Thus, each bank favors mergers in the sector but does not want itself to be a part of mergers. Unless mergers lead to dramatic improvement in the cost structure and lead to significant increase in market share, the prisoners' dilemma identified will render consolidation in the sector highly unlikely.

5 Appendix: A Quick Glance at the Turkish Banking Industry Structure[5]

At the end of 1999, there were 81 banks operating in Turkey. The total assets amounted U.S.D 133.5 billion. The deposits totaled U.S.D 89.3 billion for the whole industry in the same year, while total amount of loans extended by the industry equaled U.S.D 40.2 billion. The reserve requirements were 6% for the TL deposits and 3% for the FX deposits. The liquidity requirement ratios were 8% and 3% for TL deposits and FX deposits, respectively. Table A1 below presents further data on Turkish banking sector for 1999.

Table A1: Turkish Banking Sector in 1999

	Number of Banks	Assets (%)	Deposits (%)	Loans (%)
Commercial Banks	62	95	100	90
State Owned	4	35	40	28
Privately Owned	31	49	46	55
Foreign Owned	19	5	3	3
Fund	8	6	11	4
Dev.and Inv. Banks	19	5	-	10
State Owned	3	N/A	-	N/A
Privately Owned	13	N/A	-	N/A
Foreign Owned	3	N/A	-	N/A

Table A2 below presents data on a group of privately owned commercial banks. The first group, consisting of banks with assets in the U.S.D 5-10 billion range, is what can be considered as the "dominant" group of bank with market power. The total assets of the 5 banks in this group make up about 61% of the assets of all privately owned commercial banks. The rest of the banks listed in Table A2 are considerably smaller in size than the first (dominant) group. This group can be considered as the "fringe" without market power. The total assets of the 20 banks listed in Table A2 make up about 95% of the assets of all privately owned commercial banks, and roughly the same ratio applies to deposits and loans as well.

[5] Data in this section are taken from Banks in Turkey [1]

Table A2: A Group of Private Commercial Banks (1999)*			
Ranked by Asset Size	Assets (%)	Deposits (%)	Loans (%)
U.S.D. 5-10 Billion			
Yapı Kredi	6.8	7.2	8.9
İş Bankası	6.6	6.2	7.5
Garanti	6.3	5.0	6.5
Akbank	6.0	5.4	6.3
Pamukbank	4.5	5.0	8.6
Group Total	**30.2** (**61.1**)**	**28.8** (**61.9**)	**37.8** (**68.9**)
U.S.D. 2-5 Billion			
Demirbank	2.2	2.3	2.0
Finansbank	1.9	1.1	1.1
Körfezbank	1.8	1.7	0.9
Koçbank	1.7	1.8	1.8
Toprakbank	1.6	1.6	1.2
Group Total	**9.2** (**18.5**)	**8.5** (**17.9**)	**7.0** (**12.5**)
U.S.D. 1-2 Billion			
Dışbank	1.2	0.8	0.5
İktisat	1.1	0.8	0.9
TEB	0.9	0.6	0.5
Kentbank	0.8	0.8	0.9
İmar Bankası	0.8	1.0	1.3
Group Total	**4.8** (**9.6**)	**4.0** (**8.7**)	**4.1** (**7.6**)
U.S.D. 0.5-1 Billion			
Şekerbank	0.7	0.7	0.7
Alternatif Bank	0.6	0.5	0.7
Deniz Bank	0.5	0.5	0.5
EGS Bank	0.5	0.6	0.7
Tekstil Bank	0.5	0.3	0.7
Group Total	**2.8** (**5.7**)	**2.6** (**5.6**)	**3.3** (**6.1**)

* The shares reported are with respect to industry total.

** The figures in parantheses indicate the shares within all privately owned commercial banks.

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